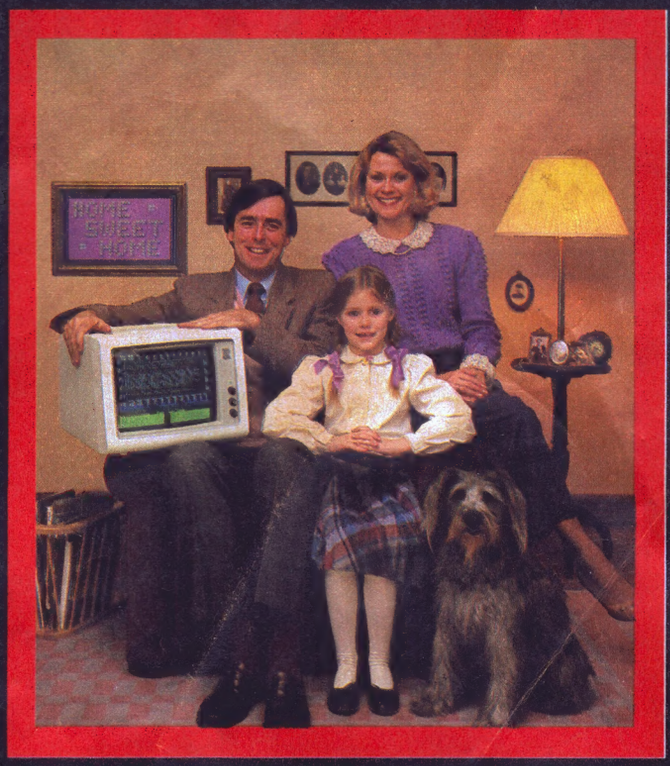
LIVING WITH THE COMPUTER



No.2: WHAT YOU NEED TO KNOW BEFORE YOU BUY

Page 4 Home choice Selecting a model to suit you **Page 10** All the extras you can buy **Page 13 Business choice** What a business computer looks like **Page 16** Choosing a system for your office, plus a guide to the makes **Page 20** Printers **Page 22** Further contacts

SUNDAY TIMES THREE-PART GUIDE

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WHAT YOU MUST DECIDE BEFORE YOU GO OUT AND BUY

When you buy your first computer, you need to take into account a variety of factors, apart from just price. Here are all the things which you will need to consider before you turn to the next page and select from our table the kind of model that will start you off on the road to computing

You can buy a computer for £40 from a chain store: and as that particular model has been around for three years, it obviously fills a need. You can, of course also spend thousands of pounds on a computer, but nobody would call a machine of that class a home computer. But as our chart on the next page shows, a home computer can cost eight times as much as the cheapest. If you are looking for a home computer, how do you make a choice in this range?

Obviously, if you have only £40, saved slowly, week by week, your choice is more or less fixed. But let's assume you are willing to spend enough to buy the computer that is best for you. How do you make the decision?

First, you decide what you want to do with it. An old-fashioned jibe is that home computers are bought for playing computer games, but the evidence runs somewhat against this. A recent survey showed that in a full half of the 2½m British households with a home computer it was the adults who used the machines. No doubt they play a computer game or two, but a reasonable guess is that they use the computers to learn about computing. We shall all need to know something about computing in the hi-tech years ahead, and it is quite astonishing how much you absorb, and how quickly, just by operating your home computer.

You can learn a lot even from the humblest machine. You can write programs and store them and retrieve them. You can play some games. You can run the programs that are offered on cassettes in chain stores and in the specialist shops. But you are very limited.

THE INTERNAL MEMORY

The main limitation is the internal memory, the Random Access Memory (the RAM). If this is small, it won't hold much of a program, and the games will be so simple as to be boring almost immediatley. And, of course, you will be very limited in the additions you can make. The Sinclair ZX81, the most successful of the very low-priced machines, has attracted an enormous following and this in turn has meant that outside suppliers are prepared to make additional memory packs and junctions and even printers.

But in the end, trying to expand a very small computer because you want it to do more than it was really meant to is an uphill struggle mainly pursued by enthusiatic hobbyists. You can, if you wish, buy one just to try the water of computing but you should really be prepared to start again if you want to do more than the machine was meant to do in the first place.

THE SUPPLIER

This business of outside suppliers is important. The computer itself won't be the only thing you'll buy. You will certainly need a cassette recorder and you will probably want extra hardware – a printer, say, or a joystick so that you can play games more easily. These are often made by the computer manufacturers themselves but, for a popular make, other manufacturers will make alternatives, which may well be better than the manufacturers' own and certainly gives you freedom of choice. For this reason, you should be very cautious about buying one of the less popular makes. A good dealer can guide you in this: and you can get some idea by seeing which makes are stocked by the chain stores. They won't have signed a contract with a small manufacturer.

For the same reason – the possiblility that there will not be much additional equipment available – you should be very careful about home computers at ultra-bargain prices. The home-computer industry is savagely competitive, and one or two manufacturers have decided to pull out of it – Texas Instruments is a recent example. These companies will continue to support their customers, of course: but outside manufacturers may not be attracted towards making equipment for them. The same problem occurs, for a different reason, with a new make. If it cannot use equipment that is widely available, it may be some time before manufacturers make extra hardware for it.

COMPATIBILITY

There is another aspect to the problem of additional equipment: some computers are made so that they will accept only the manufacturers, own extras. The advantage of this is that the extra equipment will have good electrical connections and will in general be of the same standard as the computers themselves: the disadvantage is that this "dedicated" equipment is usually more expensive than that made in the competitive world outside.

BOOKS AND MANUALS

The question of popularity comes up again when you are looking for books about your particular computer. You are pretty certain to need at least one of these. Though the manufacturers would deny it, the instruction manuals that come with home computers are almost uniformly difficult to follow.

This has led to a virtually unique secondary industry – the production of "independent" guides to particular machines. We are publishing a bibliography in the next issue, but a visit to the computer department of any shop will show you that there are very good guides to using some of the most popular models. In fact, for the most popular models, there is a complete range of instruction manuals available that will take you from the very beginning to advanced uses.

PROGRAMS

Even more important than the problem of hardware is that of software. Your computer is useless without programs to run on it. You could learn to write all the programs you need, but it isn't likely that you will. If you flip through a few computer magazines that have program listings – programs printed out – you will see that they are usually very long and quite tedious even to copy into your machine.

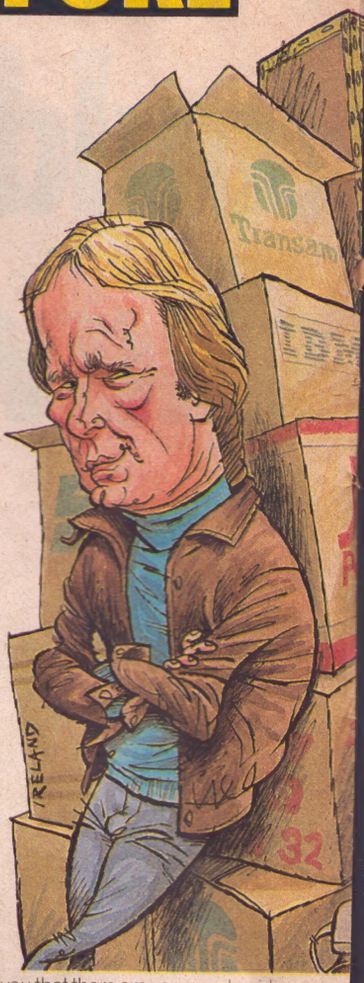
If you get excited by programming, you will try writing elaborate games or educational programs: but you will certainly also want to buy ready-made programs. And these are mainly written for the more popular machines – a stroll around any home-computer shop will demonstrate this. This needn't be the deciding factor in your choosing your home computer, but you must keep it in mind.

THE NEXT STEP

These factors should all be weighed when looking at the next upward grade of computer, the

These are the computers we have chosen as the basic models in the selection table that appears on the next page. They are typical in their price range and functions. Top left: Sinclair ZX81, a starting system. Bottom left: Sinclair Spectrum, for games and programming. Bottom right: the portable Tandy 100, for text processing and management. Top right: the multi-purpose BBC

PHOTOGRAPH BY ALEX DUFORT



Editor: Tony Osman.

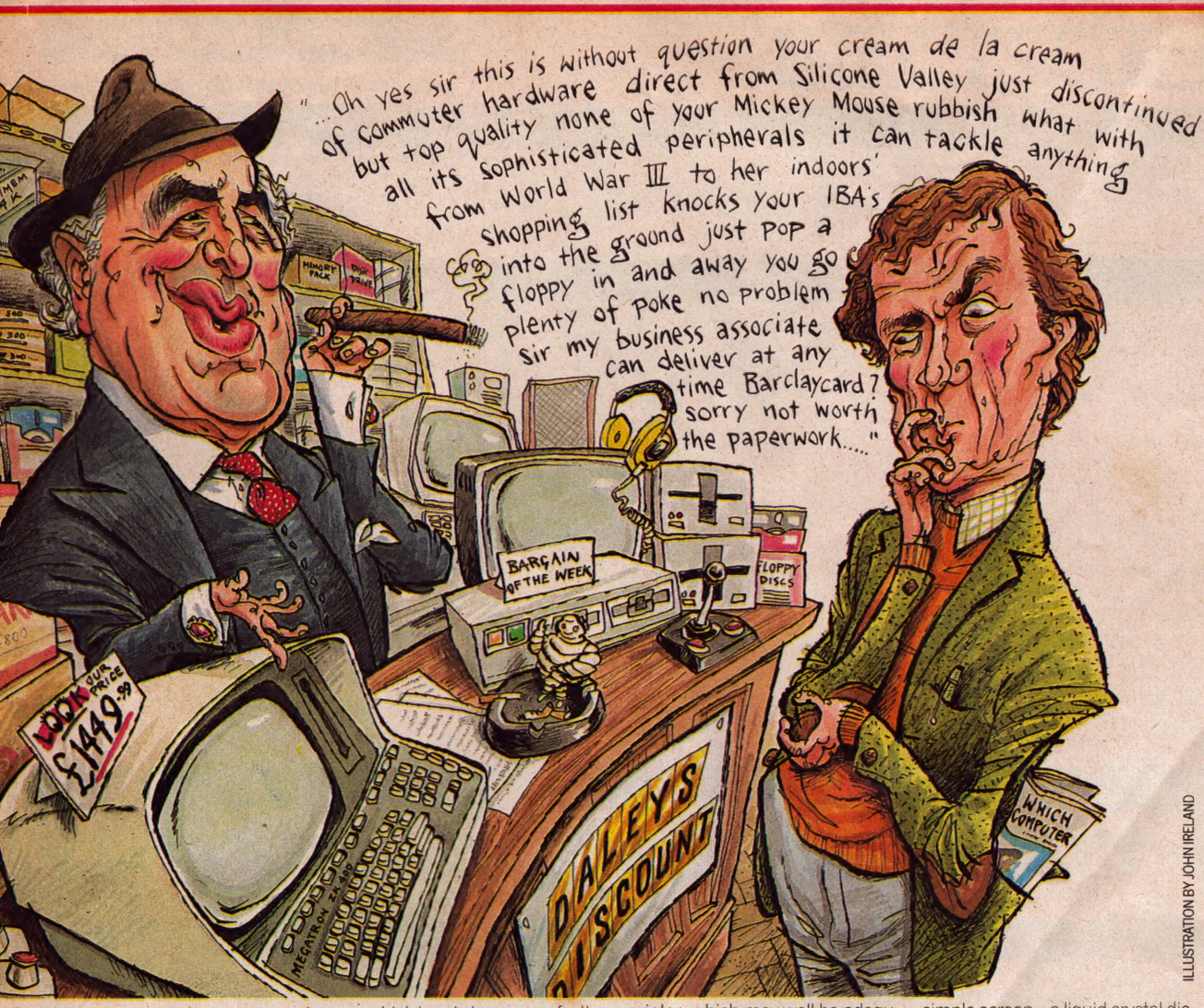

"...Oh yes sir this is without question your cream de la cream of commuter hardware direct from Silicone Valley just discontinued but top quality none of your Mickey Mouse rubbish what with all its sophisticated peripherals it can tackle anything from World War III to her indoors' shopping list knocks your IBA's into the ground just pop a floppy in and away you go plenty of poke no problem sir my business associate can deliver at any time Barclaycard? sorry not worth the paperwork....."
BARGAIN OF THE WEEK
FLOPPY DISCS
DALEYS DISCOUNT
WHICH COMPUTER
£149.99
MEGATRON Z-80

ILLUSTRATION BY JOHN IRELAND

second group on the table of makes on the following page. This contains machines that in general could be used for word processing or keeping your household accounts, although to do either of these you really need a more powerful machine. The computers in this group are still really for learning about computers and for playing games. As the table shows, they range in price from £99 to £300.

The first consideration, once you are sure that there are enough programs and additional equipment available, is the memory – the RAM. This is shown on the table both as pages of text and as bytes, and if you want to get the most from computing, the more memory the better. Some of the most fascinating adventure games, for example, need the full 40K of the larger Sinclair Spectrum: you can, though, learn an enormous amount about computing on a machine with a more modest memory.

The total amount of memory available can be, it is worth knowing, misleading. On some machines, rather a lot of this memory is used up by the computer when it is running: you really need to discover how much is available to the user, a figure which is always known by the manufacturer, but one which is not always easy for the buyer to find out.

EXPANDABILITY

A home computer is not so expensive that you have to think of it as a lifetime purchase: on the other hand, you don't want to have to replace it as soon as your ambitions get a little higher. Look therefore at expandability. Firstly, can you improve the cassette recorder as a back-up memory? The cassette recorder is simple and effective, but limiting because it is so slow. The tape must be read for a program to be loaded which takes time. Even more irksome is the delay if you have used the cassette to store information. The computer may have to spend time hunting backwards and forwards on the tape to find successive items.

The Sinclair machines solve this with a Microdrive – a wide continuous band of magnetic tape that can be scanned very quickly. The more usual solution is a floppy disk drive, which spins a disk coated with magnetic material similar to that on a cassette tape. If you think you may want to extend the use of your computer, check whether you can use a disk drive.

Also, while looking at expandability, see if it can use a standard printer. Some machines have a connection that fits only their own printer, which may well be adequate at the beginning, but can be limiting if you get more enthusiastic. The standard connections are, most usually, either a Centronics interface or an RS232C interface. Even if it has to be added after you have the machine, either of these will give you access to a wide range of printers.

Another "expandability" project you might want to consider is communication. If your machine has an RS232C interface, you can link in to the telephone system. You can communicate with other computers, send or receive electronic mail, tap information stores. There is, for the home computer, a rather specialised network, Micronet 800, that links other computers through Prestel, and that contains programs that you can collect – "download" – onto your own machine. The Sinclair Spectrum can be connected to Micronet 800.

VISUAL DISPLAY

Home computers can virtually all generate images in colour on a colour TV, but the computers in the next group, portable business machines, battery operated, can work only in black and white. This disadvanatage is fully repaid for one group of users – people on the move – by the fact that the computers have a built-in screen. It is a simple screen – a liquid crystal display (LCD) – similar to that in a pocket calculator, and it is small, so that it shows only a few lines at a time. You have to "scroll" through the text to get the part that interests you onto the screen.

PORTABLES

All the disadvantages in portable machines are overcome by the virtues of the computer, if you happen to want it. It is a complete, and completely portable, computer and even has a battery-powered back-up memory so if you are a businessman on the move, or a journalist, you can work on your accounts or prepare messages or compose your story on the machine in your hotel room, or even in a meeting, because the machines are completely silent.

The machines can be connected through a modem to the telephone system, and thence to other computers. The businessman can pick up information from his office computer, as well as putting his report into it. The journalist can send his story back to a computer at the newspaper. Either kind of user can pick up messages and leave them. These are "real" computers with a real practical use.

EDUCATION

The computers in the last group of the table are also "real", in a different way. These machines are at, or bridge, the gap between the home computer and the "serious" machine, though probably nothing qualifies as a serious machine if it doesn't have a built-in disk drive or equivalent.

But the point about these machines is that they have large memories, a full-size typewriter keyboard, and an almost limitless expandability. They are also popular models which have inspired a wide range of software companies. These machines can, of course, be used for computer games and for learning about programming. But their significant virtue lies in their extra capabilities.

First, they can be used for education – self education – in subjects other than computing. There are extensive programs of educational courses available, mainly for children of primary school age, but with a reasonable amount available for older children. You can learn most subjects on a programmed question-and-answer basis, which is not greatly instructive, but useful in revision. But, in addition, there are genuine courses in, say, foreign languages – at least one of these includes speech, so that you learn pronunciation. There are courses in science, in one of which the computer produces images of light beams striking mirrors and passing through lenses. The student can move the lenses and mirrors about on the screen and see what happens to the rays of light. Another educational program takes the student through memorable battles and revolutions. The student decides how to deal with the changing situation, and the computer either accepts the solution or explains why the particular general, or politician, behaved in a different way.

BUSINESS

These superior home computers can also be used as business machines. If you are a freelance writer or painter, or run a small business, you will be able to get programs to help you. (It is sensible, of course, to check that there is a program for the particular business that interests you available for the computer you are thinking of buying.) These computers can be used in management, and also for text handling–preparing reports, writing a novel – making it possible for you to write your text onto the screen and then edit it until you are satisfied enough to run off a print.

If your demands on a computer are more than these machines can meet, then you probably need a small business computer, and we publish a guide to these on pages 16 to 19. These, of course, are serious machines, intended for serious use. It is comforting to know that the indefatigable ingenuity of the software industry has made sure that there are some ingenious computer games available even for these more expensive machines.

Special consultant: Professor Dennis Parkinson, Queen Mary College, London. Contributors to this issue: Jane Bird, David Fairbirn, Jerry Sanders. Design: Pedro Silmon

NOW SELECT YOUR MODEL

		MEMORY IN PAGES (BYTES)				
		½-8 (4K)	8 (16K)	16 (32K)	24 (48K)	32 (64K)
STARTING SYSTEMS – Learning about computers; elementary programming; simple games						
SINCLAIR ZX81	**Memory** ½-8 pages **Keyboard** 40 touch sensitive **Screen** B&W; 32 characters **Expandability** Very limited; 24 column printer; no disks	£39				
AQUARIUS	**Benefits:** colour; 40 character screen; calculator keys		£79			
GAMES/PROGRAMMING – Games; programming; learning about computers						
SINCLAIR SPECTRUM	**Memory** 8-24 pages **Keyboard** 40 calculator keys **Screen** Colour, 32 characters **Expandability** 24 column printer; microdrive for low-cost storage		£99		£125	
ORIC/ATMOS	**Benefits:** standard disks; 24 character screen. More memory available for programs **Disadvantages:** less software		£99		£170	
ATARI 600XL	**Benefits:** full keyboard; 40 character screen		£159			
ACORN ELECTRON	**Benefits:** full keyboard; 40 character screen; expandable			£199		
TRS80 COLOUR	**Benefits:** full keyboard; expandable		£240	£300		
COLOUR GENIE	**Benefits:** full keyboard; expandable		£194	£240		
COMMODORE VIC20	**Benefits:** full keyboard; expandable **Disadvantages:** 22 character display	£119				
DRAGON	**Benefits:** full keyboard			£175	£250	
SORD M5	**Disadvantages:** limited software		£149			
SPECTRAVIDEO 318	**Benefits:** 40 character keyboard; expandable **Disadvantages:** limited software.			£199		
TEXT/MANAGEMENT (PORTABLE) – Management; text processing						
TANDY 100	**Memory** 4-24K. Battery backed **Keyboard** Full; function keys **Screen** 40-char/8-line liquid crystal **Expandability** Printer, no disks; communications; Portable	£499		£649 (24K)		
EPSON HX20	**Benefits:** more software **Disadvantages:** 20-char/4-line display		£480			
MULTI PURPOSE – Games; programming; management; education; text processing						
BBC	**Memory** 16-32 pages **Keyboard** 72 full keys; functional keys **Screen** Colour; 40-80 characters **Expandability** Excellent			£400		
SINCLAIR QL	**Benefits:** more memory; advanced software **Disadvantages:** No disks – microdrive only.					£400
COMMODORE 64	**Benefits:** price; memory **Disadvantages:** 40 character screen.				£229	
LYNX 48	**Benefits:** memory expandable to 192K **Disadvantages:** limited software.			£225	£350	
ATARI 800XL	**Benefits:** excellent games				£349	
MEMOTECH	**Benefits:** price **Disadvantages:** limited software		£275		£315	
SHARP MZ70	**Benefits:** Price **Disadvantages:** no disks				£250	
SPECTRAVIDEO 328	**Benefits:** price				£275	

HOW TO USE THE TABLE

There are three steps to follow:

1 Work out how you wish to use your computer.

2 Decide how much you can afford in the £50-£500 range.

3 Where computers have been classified according to the possible use you would wish to make of them, you will find, listed first in each group (dark blue), four basic computers (pictured on the previous page) which meet your needs. Decide which extra features you will want to use.

COMPUTER USES

The uses to which computers are put in the home break down into just a few clear categories:

1 Learning/Education: This is a prime use for a home computer. It offers the chance to learn how computers can be programmed and operated. Some computers are suitable for advanced learning and education work. A computer should have the right characteristics and the appropriate educational progams available.

2 Games playing: A wide variety of games may be played on home computers. The more advanced games require colour computers, and also colour television sets to which they may be connected.

3 Text handling: Word processing is one of the most useful applications. It requires a printer. Although simple word processing can be carried out on the games-playing systems, for effective use a column width of at least 64 characters should be available.

4 Management: There are many potential applications in the field of home accounting, maintenance of lists and records and the running of clubs and societies which lie on the borderline between home and business use. With the appropriate programs, the more advanced systems can be used in this way.

BASIS OF CHOICE

Pages: You can think of a computer's capacity in terms of typical pages, where a page is a normal A4 page with 300-400 words. The range of computer size is from half a page to 32 pages. Larger capacity systems can run more complex programs and give more flexibility. Larger quantities of information or program code will be held on tape or disk if it is available and moved into the main memory as required.

LOADING SPEED

The speed with which information can be transferred to or from a cassette tape varies with different systems. Tape systems are slower than disk, which will transfer a page in a fraction of a second. There is an alternative way of loading program information – directly from a cartridge. This gives extremely fast loading, but the cartridges may cost as much as £30 for a program.

KEYBOARD

The simplest keyboards use a touch-sensitive membrane and are less pleasant to use than a full typewriter keyboard. An intermediate variety has small raised keys which are satisfactory for elementary programming and for games but not for extensive word-processing or management use.

SCREEN DISPLAY

For games playing, colour is a major feature and is offered on all but the cheapest systems. It must, however, be remembered that the system will be occupying your colour television set when in use. Most screens generally display about half a page of information with 40 or fewer characters per line. For word-processing or business use you need 64/80 characters and should choose a system which offers this facility.

And who's going to pay for my IBM Personal Computer?

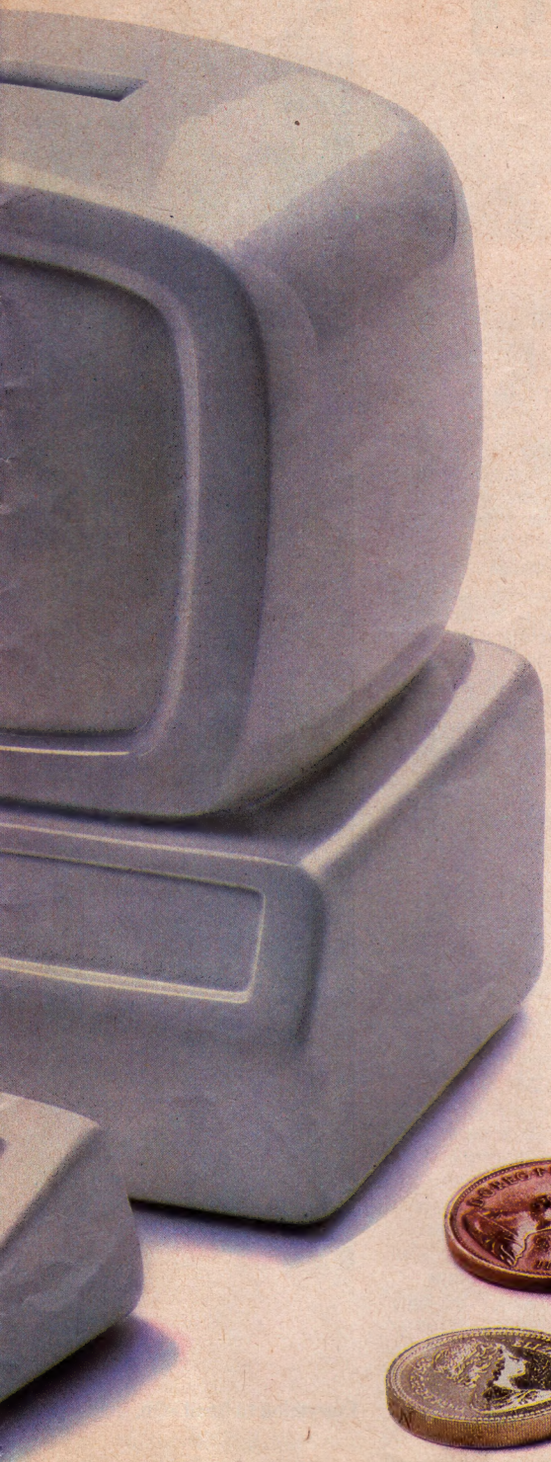
Probably the computer itself.

Although IBM's hardware may cost rather more than sticking to your manual system, the initial outlay is soon repaid.

To start with, the IBM Personal Computer has so much business software being written for it that you are more than likely to find the exact software you need.

Secondly, because the IBM Personal Computer is designed with the flexibility to grow with your needs, it's also built to last.

So, being both robust and flexible, we can confidently predict that it will still be around in years to come.



And, naturally, it can link to IBM mainframes, increasing its versatility.

If you want to save a few pounds in the short term, don't buy an IBM.

Just remember, in the long term, sticking to your manual system could cost you more.

For further details, phone 01-200 0200 or clip the coupon.

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IBM

THE EXTRAS THAT WILL MAKE THE MOST OF YOUR MACHINE

If you want to spend money on gadgets to make your computer perform a greater number of tasks, there is only your bank manager to stop you. From giving more fun to games to helping with your accounts, these add-ons will make your system – and your understanding of computers – grow

Any of the "add-ons" mentioned here are available for your computer, but before you buy, be certain it is "compatible". In other words that it will be able to run on your particular machine. Bear in mind, too, that one day you might want to change your computer and your add-ons will need to adapt to different machines.

STORAGE SYSTEMS

Tape cassettes for storing programs or information on home computers are very limited. They have a small capacity and you can only locate the program or data you need by reading all the way through the tape. Disk drives offer lots of storage – more than a megabyte in some cases – and "random access" because the reading head can move quickly to any part of the disk. As you might expect, disks cost more, starting at around £200.

Characteristic of the micro world, disks are getting smaller. They were first 8in in diameter, then 5¼in and now they are often under 4in. These last, called micro floppies, live in robust plastic envelopes and can be carried around in your coat pocket. The Electroniquip 3in disc for the BBC Acorn Computer costs £198.95 but to use this, you need a £12 Micro DFS to modify the computer.

Many business programs are written so that they can be used on computers that will accept particular operating systems, such as CP/M and Unix. If your home computer is compatible with one of these, you will need a disk drive to use the disk that carries the operating instructions. The Torch Z80 Disc Pack, at £839.50, comes with a suite of software from the Perfect range, including word processor data base, spreadsheet and spelling checker.

For flexibility and future upgrading, the Cyborg disk drive with its 720K is worth considering. It can be used with a range of machines: ZX81, Spectrum, Oric, Atari, Vic 20, Commodore 64, BBC, Dragon, Apple IIe and TI99/4A. Once you've grown out of your ZX81, you can upgrade to a new and incompatible computer and keep the same files on the same disks by reprogramming them.

If disks are beyond your budget there are a few alternatives which offer faster access on cassettes. For Sinclair owners, the Microdrive uses continuous loop tape cartridges of around 85K and these are just beginning to appear in the shops. Maximum access is 3.5 seconds and loading a 48K program takes around 9 seconds. The Microdrive doesn't plug straight into the Spectrum, you have to use the Interface 1, (£29.95 when purchased with the Microdrive which itself costs £49.95).

An alternative for BBC or Nascom owners is a high-speed mini-cassette unit, Ultra Drive, which costs £79.95.

PRINTERS AND PLOTTERS

Once you have a functioning computer, a printer to put your information on paper is probably the first add-on you will need. The concept of a paperless society is pure fantasy, as people always want something they can fold up and take away.

There are two types of printer for home machines – daisywheel and dot matrix – which are described on page 20.

The Daisy Step 2000 produces 20 characters a second and at £333 is good value. With the new Adam home computer you get a daisywheel printer plus word processing directly accessible on a chip for a total price of less than £700.

Dot-matrix printers are much faster – the £380 Epson FX-80 prints at 160 characters a second – but the quality of the characters is cruder, though perfectly legible. They can also produce graphics, but if you want to draw pie diagrams or map out a graph of your biorhythms in different colours, you need a plotter. These usually hold several different coloured pens which draw on the paper.

For personal use, the four-colour MCP 40 plotter costs £129.96, and comes in a number of guises, as an add-on for the Tandy, Oric and Sharp computers, for instance. Because it uses a pen for drawing, not printing, character size can be as big as you like. As the paper is only 4in wide, you can even turn the text on its side to print out longer lines.

If you have produced stunning graphics on the screen and your printer/plotter has a standard interface, don't assume you'll be able to print it out automatically. Printing out complex graphics is a difficult task and you may well need to buy special software to do it.

To connect to your computer, nearly all printers have either the RS232C standard serial interface or the Centronics parallel. You'll need a matching interface on your own computer.

Thermal printers are the cheapest. They are much quieter and they use special paper which contains a black layer within it. The pins burn the paper off so the black shows through in the form of the desired character.

The ZX thermal printer, at £39.95, takes 4½in wide silver-coloured paper, and the Alphacom, at £59.95, takes white paper.

Also worth looking at is the Brother EP-44, £253, a battery-powered portable typewriter/printer with a 4K memory, a "window" which shows the last 15 characters you have typed and an RS232C interface so it can be used to print from your computer.

SPEECH SYNTHESISERS

Most computers don't come with speech synthesising chips installed. You buy an add-on chip or a box which plugs into one of the interface sockets. But even after that you are still very much on your own, for there is hardly any commercial software that makes use of these.

The BBC computer has by far the easiest speech synthesiser to use the Acorn's Speech System chip which costs £55 including fitting. It has a ready-made dictionary of 165 words or part words. And the speech is modelled on the voice of Kenneth Kendall.

A cheaper alternative for Spectrum owners (and promised for the ZX81, Oric, Dragon and BBC) is the Currah Microspeech at £29.95. For the Vic 20 you can buy the Adman, at a pricier £49.95.

Another option is the Chatterbox (£57 or £47 in kit form), available on a huge range of home computers as a plug-in unit. This uses the more flexible phonemes but is the most difficult to program. However, it does have the advantage of connecting up with the Big Ears speech recognition system, which costs £57.50.

JOYSTICKS

A joystick makes games more lifelike by putting the control of an object on screen directly into your hand. It improves speed and accuracy; instead of using specific keys to dodge the path of missiles, you can thrust the joystick left, right, up and down to escape.

To fire a missile, the joystick might have a trigger in its handle, which you activate with your thumb. Or it might have a separate button which you press with the other hand. You also might use the joystick in conjunction with the keyboard, using the stick for directional control and the keys to perform actions like rescuing the maiden from a dragon's clutch, or gulping down a banana. Dual joysticks, for about twice the price, allow two players to compete.

The smoother motion that a joystick provides is also useful for drawing pictures on the screen. These can be saved as part of your own game or animation sequence. They can also be used in business applications especially for selecting from menus or editing text. In fact, though not officially recommended, you can use a joystick with the Commodore 64 word-processor, Easy Script (£75).

One problem with using a single joystick instead of specified keys is that games software tends to make use of different sets of keys. You have to make sure when you buy the game that it contains the necessary instructions to make it work with your joystick. And it is rare to find one joystick that works with all the commercially available software. If you are a Spectrum or ZX81 owner, you can get round this with the AGF Programmable Joystick Interface (£26.95).

Joysticks cost from £10 to £25. If you really feel like lashing out, try Trick Stick (£28) which offers proportional control for varying speeds

Everything to hand with, from bottom

PHOTOGRAPH BY VICTOR WATTS. HARDWARE FROM RUMBELOWS, COMPUTERS OF WIGMORE STREET AND TELESONIC. FURNITURE FROM MARCATRÉ

left to right: cassette, joystick, acoustic coupler (modem), disk drive and in the background, left a printer. With all these add-ons, your computer will reach the limit of its use

and rates of turn.

LIGHTPENS

A lightpen is a pen-shaped case with a light detector in the end. It works by detecting the dot that flashes across the 625 lines of your TV screen 25 times every second. It can calculate exactly where it has seen the dot pass and therefore allows the software to pick up what is on the screen.

Lightpens may have difficulty detecting dark colours. They must also be able to avoid "seeing" the screen before the pen is placed in the desired position. The Stack lightpen (£28.75) which works for Commodore 64, Vic 20, Atari and BBC, has a metal contact on the pen itself that you touch when you want to activate the light detector. The Stack also has lots of software available but most of it is for strategy games.

Other further thing to check is a lightpen's resolution. It may not be able to see fine detail on the screen.

MODEMS

A modem converts the digital data in your computer into analogue, or wave-form data, so that it can be sent down the telephone lines to talk to other computers.

This gives you access to information on Prestel and its "magazines" like Viewfax and Micronet. There are also dial-up bulletin boards organised by clubs or individuals (details of these are on page 22). One great advantage is that you can "download" programs – get them into your machine from a central store. Of course you have to pay for the phone calls but it's much less laborious than typing in listings published in books and the computer magazines.

Remember that modems have to be government-approved if you're going to use them on the public telephone network, and there are also different communications standards. In this country the common standards to note are V21 and V23. V21 sends and receives data at 300 bits a second (about 50 characters a second) and is used by clubs and bulletin boards. V23 is the Prestel standard and allows you to receive data at 1200 bits a second but only transmits it at 300.

The cheapest type of modem uses an acoustic coupler, a box with two rubber cups into which you insert the telephone handset.

An excellent value V21 modem is DaCom's Buzzbox, at £69.95. But there are other costs to networking. You'll need a two-way adaptor to connect the modem in parallel with your phone so that you can manually dial the number then switch to the modem once the connection has been made. You'll also need a cable to connect the modem to your computer. The DaCom one costs £28.75, though your local computer shop should be able to make one up for less. You may also have to buy an RS232 interface for your computer. ZX81 owners could try the new adaptor from Microcomputer Resources for £29.95.

If you've got more money to spend, the ideal thing is to buy a modem that offers lots of standards. The Dacom DSL 2123 is officially approved and detects V21, V23 and voice. It costs £264.50 or £552 for a version which has automatic dialling and storage for 32 telephone numbers.

Q.E.D.

Quad erat demonstrandum

There is no doubt that the majority of businesses are going to benefit from using a microcomputer.

The problem is identifying the system which will really work for your business. Take professional advice – talk to a DRG Microdealer.

DRG Microsystems are the largest independant distributors of business microcomputers in the UK. Unlike any other, our nationwide Microdealer network has the backing of the £600 million DRG Parent Company (This means we're here to stay).

DRG Microdealers offer the full range of best selling DRG Sirius and Apricot Microcomputers, a vast range of software (enough to solve your problems), and a range of high quality printers and peripherals that might surprise you.

More importantly, DRG Microdealers are fully qualified to analyse your business requirements, train people to operate your installed system, and provide a nationwide maintenance service which ensures that help is never far away.

When you come to think of it, if you want a business computer, there's no real alternative to your local DRG Microdealer. Q.E.D. (which was the thing that had to be proved.)

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The best selling 16-bit business microcomputer.

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STM

A business computer needs to show more on its screen, and to store much more information than a home computer. Its monitor and disk drives are usually built in, but not printers or acoustic couplers

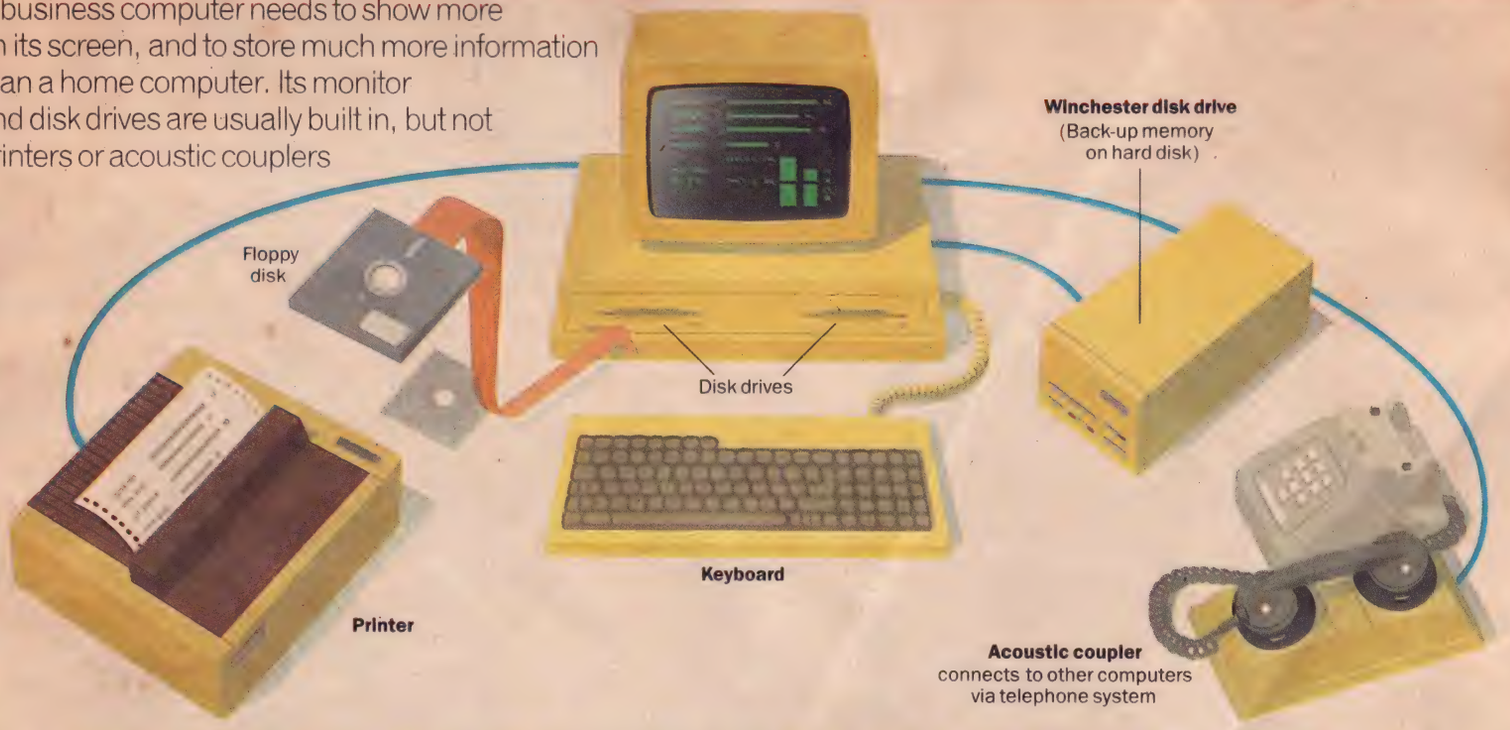


ILLUSTRATION BY JOHN GRIMWADE

THE COMPUTER IN YOUR OFFICE

The office computer is clearly a relative of the one you have at home – this is why you can learn so much about "real" computing from a humble home machine. Both have keyboards, both have the computer itself, hidden under a cover, and both have screens like a TV screen. In most home computers, the screen actually is a TV.

Most business machines are used for keeping accounts, and as the accounting and estimating and stock control of different businesses can vary quite a lot, most accounting uses special software designed for a particular kind of business. There is a "bakery package," for example, or one for magazine publishing.

But there are also general business processes that use computers, and these come under three headings – word processing, data handling and financial modelling. These will be dealt with in some detail in the next issue, but it makes sense to know what they are from the start, especially as these uses have fixed the computer design.

WORD PROCESSING

Word processing is an attractive technique for writers as well as businesspeople. Described very approximately, it is a method for editing text on a computer, but the possibilities are more fascinating than that phrase suggests. You can type your text – a letter, a report, an article, a novel – and the words appear on the computer screen. Then you can have second thoughts and change words, shift paragraphs, shorten or lengthen the text. And finally, when you are satisfied, you tell your machine to print and get a perfect typescript.

This is a fairly simple application, though a delight to authors. But word processing can do more. You can write a proposal describing how you would advertise one make of beer, naming the make frequently, and then, if you fail to get that account, you can tell the machine to substitute the name of another make throughout and make a second proposal.

To do all this, the computer of course needs word processing software: but it also needs a better display than the average home computer. The screen is called a **monitor**, which signifies that the signal goes directly into it, without having to pass through a TV receiver. It will have finer resolution, and probably a layer to cut down reflection. Further, the computer will normally produce the text a full 80 characters wide on the screen. Most home computers work to half that, which means that you never know exactly how the text will appear until you print it.

The modest capacity of a cassette recorder as a permanent memory is quite inadequate for general business use (though some portable business machines use nothing more). A cassette can hold only about 100 names and addresses, and it takes a long while to find a particular piece of information.

So a business computer uses **floppy disks**. These look a bit like small gramophone records, but they are actually coated with magnetic material, as the tape of a tape recorder is, and this receives and stores messages from the computer. The floppy disk comes in a cardboard or plastic cover, and the disk, cover and all, is fed into a slot on the computer or on a separate disk drive. Here it is spun rapidly, and the information on it read by a magnetic head, again something like that on a tape recorder. The difference is that this head "scans" the entire width of the disk as it spins, so it can quickly find information. The disks come in different standard sizes, for different computers, but any size can hold more information than a cassette. A cassette holds about 300 kilobytes, a floppy disk more than a thousand kilobytes (a megabyte).

The computer shown above has two slots for disks. One can be used for the program the other for information: the program disk can then be removed once the program has been read into the computer allowing both slots to be used for information.

Another possibility is to use one slot for a disk that carries the "operating system" for a particular program. This is a piece of "general software" – which organises and controls filing and recalling, involving disks (typical systems are CP/M, MSDOS, Unix). The other slot will carry the actual program, and both can be removed once the program is in the computer, leaving the disk drives free for information.

Some business uses need even more back-up memory than floppy disks can give. A "hard disk" – a "Winchester disk" – can be the solution. Some computers have built-in **Winchester disk drives**: the drive has to be added separately to others. Winchester disks hold 20 or more megabytes.

DATA HANDLING

These enormous amounts of memory are often needed for the second general business use of computers – data handling. This is everything to do with making records, filing, indexing, and, eventually, retrieving the information. You can keep company files on a computer, but you can also file addresses, credit limits, products handled, stock lists. And you can recover the information in novel forms. You may have filed names and addresses of customers and then attached their accounts. You can ask the computer to find, say, all the customers in Bristol who owe you more than £20,000. You can, alternatively, ask the computer to decide on the best route to link a selected list of clients, so that your salespeople save time. Or you can simply file vast amounts of information and be able to recover it almost instantaneously.

FINANCIAL MODELLING

The third general use of a business computer is "financial modelling". A simple version of this is a spreadsheet shown in last week's issue. You build this up by listing the various sources of expenditure and income for your business and relating them. What fraction, for example, of the total cost of printing a magazine is the result of the cost of paper? You fit this factor into your spreadsheet, and you can then try the effect of altering the price of paper, or the number of copies printed. You have a "model" of your business, and can answer the "What happens if . . .?" questions.

The **printers** that business machines use are simply more powerful ones that those that are acceptable to the beginning home computer user. Broadly, there are two groups. One produces "letter quality" print – the equivalent of that from a good electric typewriter. The most common printer for this uses a "daisywheel," a stalk with type on arms radiating from it. For a more detailed description of printers turn to page 20.

Computers can link with other computers, for "electronic mail" or so as to pool information. One possibility is a "local area network" that will link all the computers in a company through wiring put in rather like the telephone wiring. Linking more distant machines can use the telephone system. Separate computers can communicate by an **acoustic coupler**, containing a modem, which actually uses a telephone: another possibility is a separate "modem" which accepts one connection from the computer and another from the telephone system. The messages can travel either on the ordinary telephone connection wiring or on special networks such as Telecom Gold.

The problem with buying a home computer, as you may already have discovered, is there's often very little software to go with it. Or all that is available is games, games and more games.

There's no such problem, however, with the Commodore 64. It has a more extensive range of serious software than any other home computer.

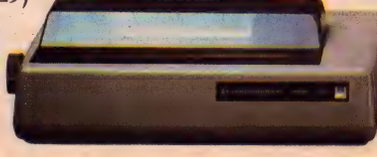
It also has an unusually large (in fact elephantine) 64K memory, as well as every peripheral you're ever likely to need.

Put simply, this means the computer has the capacity to run more interesting, entertaining and complex programs.

You can teach yourself just about any subject you care to mention, even computer programming. And for the office there are programs like word processing, financial planning, information storage and stock control.

Finally, when you're mentally exhausted, you can even entertain yourself – yes, with games.

When all's said and done, however, we do have to admit that in one respect the Commodore 64 isn't up with the competition. It costs around £229, much less than any comparable machine.



And that's a fact we hope you'll never ever forget.

When you have an enormous memory there's no end to the things you can do.

Please send me further information on: the 64 computer ☐ 64 software ☐ disk drive ☐ cassette unit ☐ printers ☐ monitor ☐

Name (Mr. Mrs. Miss)

Address

Send to: The Commodore Information Centre, 675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Or telephone (0753) 79292.

commodore

6SSTM0605

Business computers can be no small investment, so it is paramount that you make the right choice. With the help of the detailed table on the following two pages, we explain how to set about finding a system to suit your specific needs

THE BUSINESS DECISIONS YOU HAVE TO TAKE FIRST

Business computers, as the illustrations show, provide an aid to planning that has never before been possible. They can, instantaneously, convert figures into graphs. This gives a visual representation of changes in profits over a year, or of the cost of raw materials. Both, even, can be presented on a graph, so that there is a vivid representation as an aid to planning. Business machines can have programs that yield a number of different representations of figures – graphs, block graphs, pie charts and "exploded" pie charts.

Choosing a computer for business use demands more care than selecting a home computer. In the home there is little to lose even if you make a poor choice, because its still likely to give enjoyment. A bad business choice, however, means waste of time and money.

This is why it is well worth going through a formal selection process which starts by defining what you intend to do with the computer. Some will prefer to have this done by an independent professional consultant. This is described as a "feasibility study" and it will cost money. In any case it is important for the prospective user of the system to learn enough to be actively involved in the process of selection which can be handled by following some simple rules and getting to grips with the essentials of microcomputing at the start. We strongly advise you to begin by booking yourself on a "hands-on" micro appreciation course for a day (costing £100 to £150) and reading an introductory book on business, as distinct from home, computers.

There are four main elements that need to be considered before buying a computer:

1 The category of computer required
2 The operating system
3 The software
4 Features of the system

But before considering these elements, you need to go through a process of selection which will help you to arrive at your choice.

THE PROCESS OF SELECTION

Once you have gained some appreciation of what microcomputers can do, the crucial next step is to set out what you want *yours* to do, what are the factors most important to you in the way it does it and what benefitsyou can expect. Use two lists. one for essential tasks and features and the other for those which are desirable but not indispensable. Where possible quantify the workload in terms of number of names and addresses, frequency of reports or other pertinent measures of projected usage. You will need to arrive at an estimate of the benefits and value of the work to be done and to be able to make the comparison with the expected costs of the system. If costs exceed benefits, think again.

How much will a system cost? Hardware prices start at a little over £2,000 but this will be less than half the total cost which must include the process of selection, training, software, maintenance and stationery. A rock bottom cost is £5,000, and £10,000 a fair average. These costs do not include the time of yourself and your staff. If the amount you feel you can afford is at the lower end of the £5,000-£20,000 range, then put that lower price down on the "essential" list. By concentrating on the key needs, you may still be able to achieve your prime objectives.

You will need to be clear on the physical requirements for the computer. Does it need to be easily or occasionally portable? Will more than one individual need to have access to it? Look at the guide to the first element below – *Categories of Computer* – to check what the different machines can do.

At least as important is the choice of software, that is the programs which will run on the computers. There will be specific "application" programs you will want to use, but also linking those programs and your computer will be an "operating system" which is a software program that enables many different applications to run on one computer. Choosing the wrong operating system will limit the applications available to you. Check the guide below on *Operating systems* as the next step.

If the main requirements on your lists call for specific applications, such as quantity surveying, hotel management, insurance or legal work, then concentrate first on finding the right programs and only then identify the hardware capable of running them. It will save time and effort to make this selection first. If, on the other hand, the main use is to be the standard tasks of word processing, financial modelling and filing (database), then you can start drawing up a list of systems consulting the guide on *Features* and relating them to your list of requirements.

The table of systems worth considering in each of the seven categories is shown on the next page. This details the computers most readily available but it should be noted that there are literally hundreds of systems available, and some excellent systems are not on the list. Don't exclude a computer because it isn't shown but use the information below, in conjunction with the table on the next page.

Having drawn up a short-list, contact the suppliers and arrange for a demonstration. Ask to see the kind of program you propose using running on the system and get a chance to "test-drive" it yourself. You will need to check up on the maintenance and software and after-sales support the supplier can offer. It is best to ask him to be specific about the support given and to check with existing users by following up references.

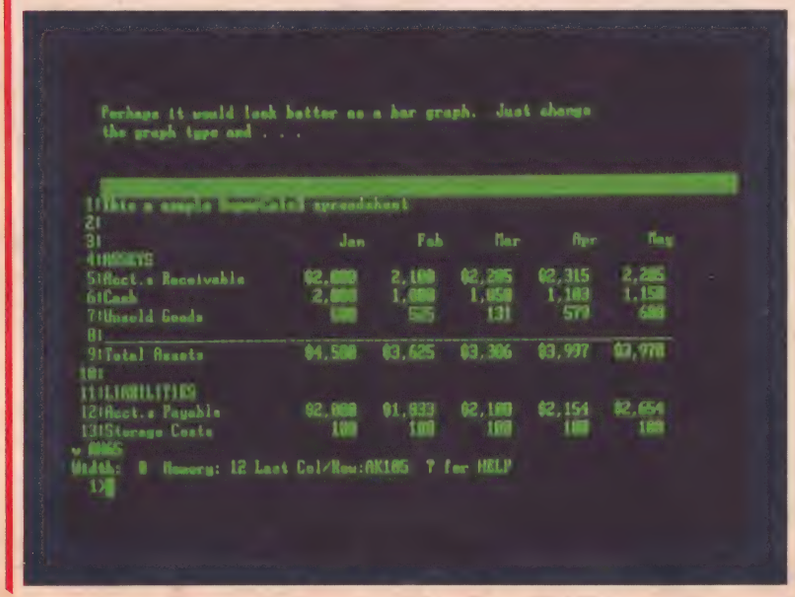
You are now ready to make a decision in principle. But before committing yourself to buy, draw up the plan showing who will do what, when and at what cost in order to get the system into use. If, and only if, it still makes sound commercial sense, then agree the contract, place the order and get into action.

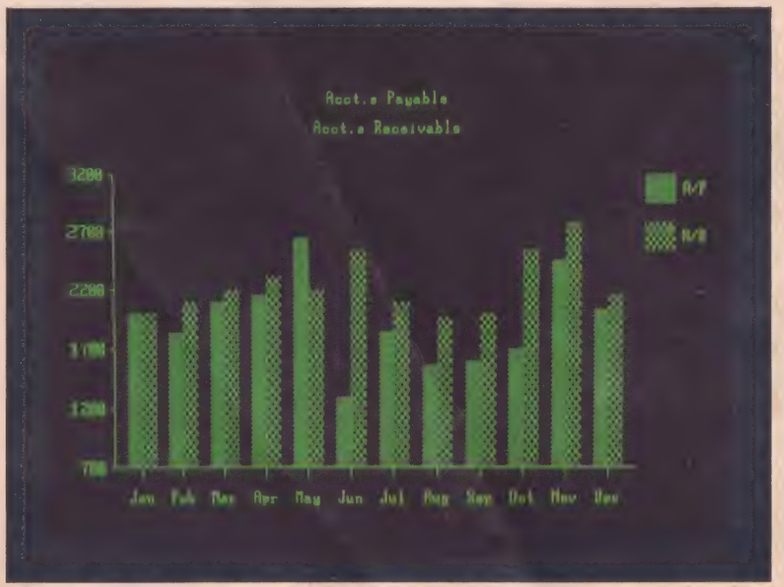
SELECTING YOUR BUSINESS COMPUTER

There are some questions which you need to resolve to decide the type of system you need. First get the answers to the three questions below clear in your mind and then narrow the search down to the appropriate category in the list.

1 How portable must your computer be? If you need it all the time and want it in your briefcase then look at *True portable*. If you need to move it fairly regularly, perhaps for weekend use, then a *Transportable* micro makes sense.

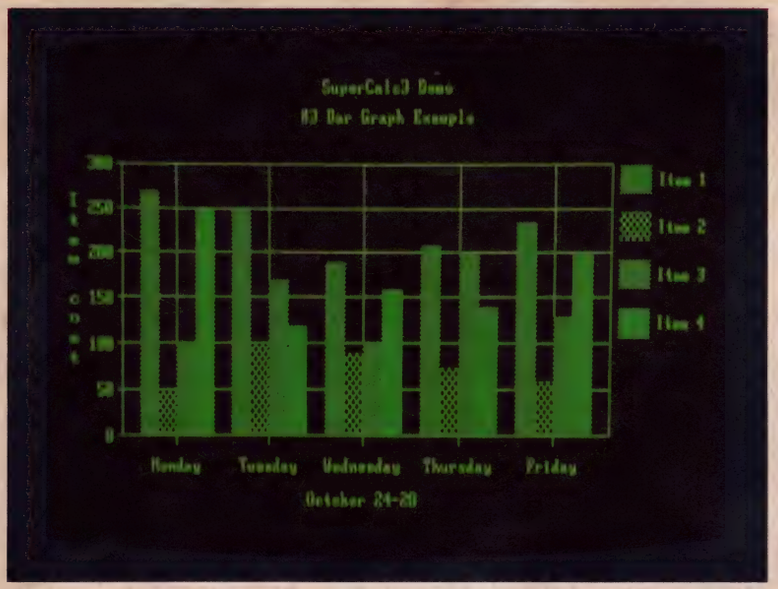
2 Do you need to share information

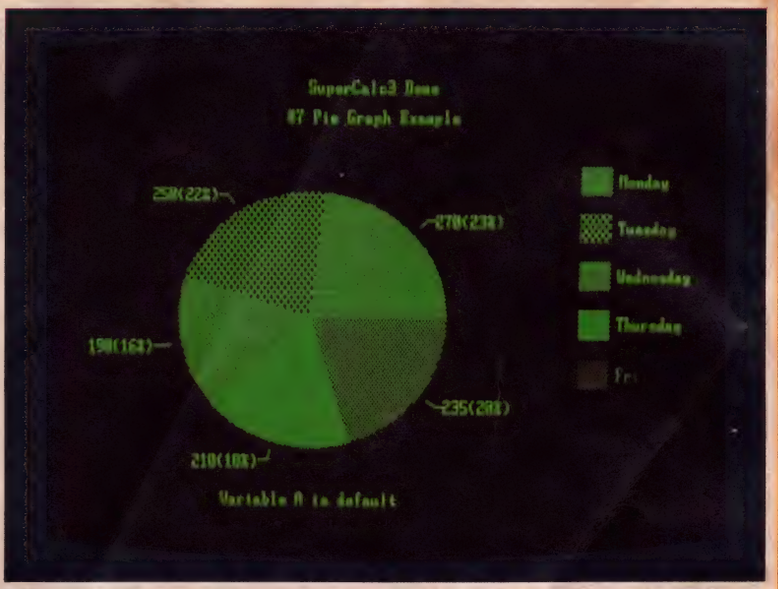




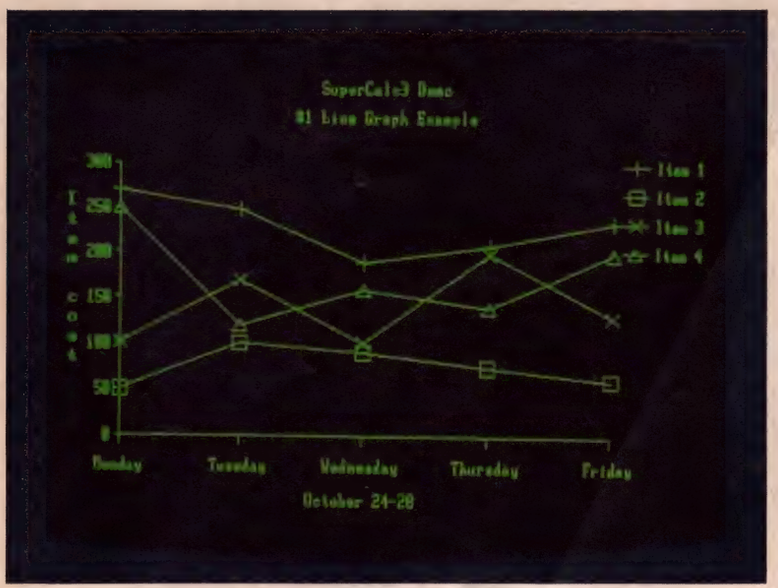
PHOTOGRAPHS BY ALEX DUFORT

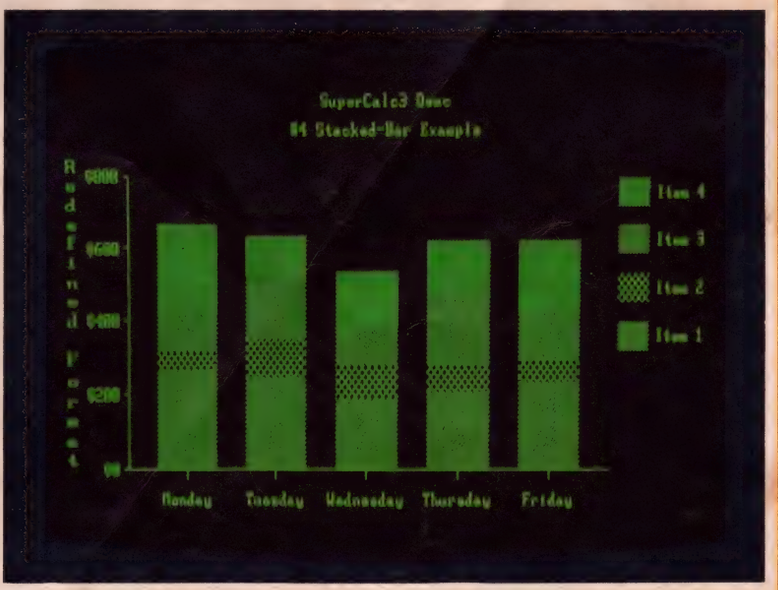
Accounts – in this case a balance sheet of assets and liabilities – can be presented in various visual forms by a computer. By doing so, the changes from month to month become clear and recognisable. Information presented in this way can be printed for reports and used for quick comparisons between succeeding years





Most computers can have software that generates graphs in a wide range of forms. Here, the "bar chart" has been converted to a "pie chart" so as to yield new information – the contributions made on the different days to the total. Pre-computer accountancy could produce such charts only after a prohibitively long time





Though the two graphs contain the same results, these are much easier to understand in the "stacked bar graph" on the right. In this, the varying contributions of the four items are summed up, so that the effects of individual variations are instantly visible as are the percentages on each working day

with other users? If you don't, then a single-user system will be cheaper and less complicated. If there is a limited need to share, then linking single-user systems on a network will probably suffice. If, however, you are proposing to work closely with others on common material then a *multi-user* system is indicated.

3 Do you want to use your computer to communicate? If so, decide whether the communication is only within the building or more widely and ensure the computer has the right facilities and software.

1 CATEGORIES OF COMPUTER

True portable

A small, lightweight battery-operated system which has its own screen and full "qwerty" keyboard. This type range from the simple note-taking aid to full function desktop machines with large (20 million character) memories and business operating systems. If you already have an office computer, an important consideration must be to ensure compatibility. In addition, if you intend to use one to communicate, make sure it either has an approved internal modem or take into account the extra costs and inconvenience an external modem will make.

Transportable

The transportable is a desktop computer scaled down sufficiently in size and weight to make it convenient to carry. The majority of these are suitable for "office to car" transportation but would be too heavy for a long walk. Some machines have a small screen which many users find difficult to read.

Simple desktop

The simple desktop machine consisting of a normal sized screen and twin floppy is today's mainstream micro. It will run at least one, and often several business operating systems and will probably have an 8 bit processor. The screen is likely to be black and white with basic graphics facilities.

Sophisticated desktop

The sophisticated desktop is based on the desktop machine with the addition of extra facilities. Many machines are capable of field upgrade from one level to another. The main features to look for will be larger amounts of storage enabling multi-tasking operating systems, high resolution graphics and colour and sound. In almost all cases the increases of storage are provided by Winchester or occassionally fixed/removable hard disks. Many systems will have facilities for backup on to special-purpose magnetic tapes (tape streamers) for added security.

Multi-user

Multi-user systems achieve lower costs per user by sharing a processor. Typical systems use a powerful main processor (usually a 68000) which is time-shared between a number of users by an operating system such as UNIX. When purchasing a system make sure that the number of users in prospect does not overload the system to such an extent that it is unusable because of the resulting poor response times.

Multi-processor

Distinct from shared processor, the multi-processor approach provides each user with his own processor. This avoids processor degradation (overload). It also provides a cheap entry point for one or two users with the possibility of future growth. In addition, as new processors become available they can be inserted into your machine, provided it has a "standard bus" (a bus is a multiple connection inside the computer) such as the S100.

Network option

The network option has many similarities to the multi-processor route, in that each user has the full power of his or her own processor. However, with this approach that power is not in a distant box but is on the user's desk. The network allows a number of machines to have local processing abilities and also to communicate between each other and use common resources such as large disk stores and printers. Networks can grow from a few terminals up to many thousands depending on the type chosen. In addition, some systems can link wildly different pieces of hardware together. However, check for software compatibility as well as hardware interfacing.

2 OPERATING SYSTEMS

Most business systems now use 16 bit processors for their main processor. For these there are three widely used operating systems which can be regarded as "mainstream" in that they enable you to run the widest range of ▶

applied software programs.

Operating system	No. of applications
MSDOS/PCDOS	1089
CPM86	683
UNIX	296

There are, however, many programs running on 8 bit processors, and systems which have both types of processor give the widest choice of software

CPM80	1498
APPLE DOS	517

If the computer you have in mind does not run one of these operating systems, then your choice of software will be more limited. Check carefully that it will do what you want now and in the future before committing to such a system. For most users the soundest advice is to go for a "mainstream" operating system and preferably choose hardware which will run more than one system.

3 THE SOFTWARE

In choosing a business microcomputer it is crucial to identify the use to which it is to be put. If it is to be used to perform a particular function, that is to run an invoicing, payroll, customer inquiry service or production control system, then it is the software which is the key decision. Find the right package first and then check out what hardware will run it.

Often, however, a computer is chosen as a generalized business tool and not just to run a specific application. The main general purpose uses are:

1 Word processing. Entering, holding, storing and printing out text.

2 Repeat calculation, usually using a "spreadsheet" which can hold and exercise the calculation formulae in an easily manageable form, and print out the results in the required way, as, for example, for a profit and loss account.

3 Message handling, with the ability to send and receive messages to other computers on a network or over the telephone lines.

4 Filing and report producing, where financial and other information can be stored, recovered, manipulated and printed out in tabular, text or graphic form depending on the type of information.

The ideal system would offer a rich array of facilities in each of these categories and would at the same time be very simple to use. In practice very flexible software makes proportionately heavy demands on the user, and you must decide how much learning you are prepared to do in order to benefit from very clever software. If in doubt, keep it simple.

As an indication these are some of the applications listed in the *NCC Microsystems Centre Directory of Business Software:-*

Application	No. of programs
Accounting	690
Payroll	124
Solicitors	45
Job costing	44
Estate agents	36
Insurance brokers	34
Quantity surveyors	30
Video library	22
Retailing	21
Hotel management	21
Chemists	16

4 FEATURES OF THE SYSTEM

Microcomputers offer a wide array of facilities, but at a cost. Decide which are important to you and in particular consider the following questions:

1 Do you want graphics and images on your computer? Be cautious about saying "No" until you have seen what colour and graphics can do to help make better use of text and number handling. Monochrome will suffice for many business applications and is less costly. In time, however, colour will predominate. But do not sacrifice facilities you do need for some you may not. Twenty megabytes of hard disk storage is more important to most users than colour.

2 How much information will you want to handle? If it is modest, then floppy disks will suffice, but if you contemplate building up files of more than 200,000 characters, or running a wide variety of software, the more expensive hard disk will be invaluable.

3 What quality of printing do you need? Dot matrix printers are the least expensive, fastest and the most flexible but do not match the quality of "daisywheel" or typewriter style printers (turn the page to find more about printers), even though the more expensive ones are now getting close.

If you need correspondence quality and have also a need for volume data processing and high-speed printing then you are likely to need both. A dual-purpose typewriter with a computer interface comes into its own in these circumstances.

Finally, having come to a decision about how your needs can best be met in each four elements, consult the chart here to find the machine that might change the efficiency and scope of your whole business life.

EVERYTHING IN ONE HANDY PACK

PHOTOGRAPH BY ROGER SCRUTON

There is now a range of self-contained, battery operated, portable computers. The one shown here has a built in printer and fits, with its acoustic coupler, into a brief case. The acoustic coupler can link this computer with another anywhere in the world – which means that it can tap large data banks, which may be the mainframe at the office, or a cuttings library, or an information service such as the one provided by the European Space Agency. Equally, the portable computer can be used to send information – sales reports, say, or news stories.

1. CATEGORY OF COMPUTER — TRUE PORTABLE

MACHINE	PRICE (£s)	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	P SYSTEM	UNIX	OWN	3. SOFTWARE INCLUDED: SPREADSHEET	WORD PROCESS	INFO. RETRIEVABLE	COMMUNICATIONS	EXECUTIVE AID	BASIC	CPU (No. of bits): 8	16	32	4. FEATURES OF THE SYSTEM: RAM (EXPANDABLE TO)	BATTERY	Memory store: TAPE	CMOS RAM	BUBBLE	ADD DISK	DRIVE TV	Inter-face: RS232	PARALLEL	WT (LBS)	COMMENTS
Tandy 100	499							●	●	●	●	●	●	●	●			8K (40K)	●		●		●		●	●	3.0	40x8 LCD display; bar code reader
Epson HX20	562							●	●		●		●	●	●			16K (32K)	●	●	●	●		●		●		3.75	20x4 display; internal tape drive
Husky	997		●										●	●	●			80K (208K)	●		●	●				●		2.5	waterproof
NEC PC8201A	546							●	●		●		●	●	●			16K (48K)	●		●					●	●	3.74	40x8
Sharp PC5000	1365			●												●		128K (256K)	●		●	●	●			●		9.5	80x8 optional printer

1. CATEGORY OF COMPUTER — TRANSPORTABLE

MACHINE	PRICE (£s)	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	P SYSTEM	UNIX	OWN	3. SOFTWARE INCLUDED: SPREADSHEET	WORD PROCESS	INFO. RETRIEVABLE	COMMUNICATIONS	EXECUTIVE AID	BASIC	CPU (No. of bits): 8	16	32	4. FEATURES OF THE SYSTEM: RAM (EXPANDABLE TO)	COLOUR	Disk storage: 3.5in	5.25in	8in	HARD	TAPE	FLOPPY (KB)	HARD (MB)	Inter-face: RS232	PARALLEL	WT (LBS)	COMMENTS
Apricot	1760	A	A	A	●	A			●			●	●	●		●		256K (768K)		2			A		720	10	●	●	26.5	separate screen
Commodore SX	899						●				●	●		●	●			64K	●		●				170				26.0	single disk drive
DMS Fox	2937		●											●				64K		2			A		600		3	●	30.0	
Kaypro	1604		●						●	●				●	●			64K		2			A		200	10	2	●	32.5	
Osborne	1719		●		A				●	●	●	●	●	●	●			64K		2					190	5	●	2	25.0	the first of its kind
Wren	1000		●						●	●	●	●	●	●	●			64K (256K)	●	2			A		400	10	●	●	20.0	sound & internal modem

CHARTS COMPILED BY THE NATIONAL COMPUTING CENTRE. ARTWORK BY: PHIL KAY

SIMPLE DESK TOP

MACHINE	PRICE (£s)	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	PSYSTEM	UNIX	OWN	3. SOFTWARE INCLUDED: SPREADSHEET	WORD PROCESS	INFO. RETRIEVABLE	COMMUNICATIONS	EXECUTIVE AID	BASIC	4. FEATURES OF THE SYSTEM: CPU (No. of bits) 8	16	32	RAM (EXPANDABLE TO)	COLOUR	Disk storage: 3.5in	5.25in	8in	HARD	TAPE	FLOPPY (KB)	Interface: HARD (MB)	RS232	PARALLEL	COMMENTS
Apple IIE	1572	A	A			A	●						●	●				64K (128K)	●	2	A	A	A	280		●	●	vast range of programs
Epson QX 10	1735		●										●	●				64K (256K)		2		A		640		●	●	Winchester available
Microdecision	1403		●						●	●			●	●				64K		2				400		2		included software
CBM 8000 Ser	1695		A				●						●	●				32K		2			A	A	1.2MB			IEEE BUS not RS232
Superbrain	1975		●											●				64K		2			A		1.5MB	2		wide range of disk storage
Tandy 4	1499		●				●							●				64K		2			A			●	●	TRS DOS in addition to CP/M

SOPHISTICATED DESK TOP

MACHINE	PRICE (£s)	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	PSYSTEM	UNIX	OWN	3. SOFTWARE INCLUDED: SPREADSHEET	WORD PROCESS	INFO. RETRIEVABLE	COMMUNICATIONS	EXECUTIVE AID	BASIC	4. FEATURES OF THE SYSTEM: CPU (No. of bits) 8	16	32	RAM (EXPANDABLE TO)	COLOUR	Disk storage: 3.5in	5.25in	8in	HARD	TAPE	FLOPPY (KB)	Interface: HARD (MB)	RS232	PARALLEL	COMMENTS
IBM PC XT	2540	A	A	A	●	A	A						●			●		64K (256K)	A		●	●		160	10		●	one of most popular micros
DEC Prof	4067		A				●						●		A	●		256K	●	2		●		400	10	●		DEC type operation system available
FTS PC86	3392		●	A	A								●			●		128K (869K)	A	2		●		500	20	●		concurrent CP/M
Lisa	4495						●		●	●	●	●	●	●			●	1MB		2		●		860	10	2	●	unique operating system
Octopus	3860		●										●		●	●		256K (640K)		2		●		400	10	2	●	5 & 20MB Winchesters available
Tycom	3335	A	A	A	A	A	A						●			●		128K (768K)		2		●		720	10	2	●	up to 20MB Winchesters avail. + Xenix

MULTIUSER

MACHINE	PRICE (£s) No. OF USERS 2	4	8	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	PSYSTEM	UNIX	OWN	4. FEATURES OF THE SYSTEM: CPU (No. of bits) 8	16	32	RAM (EXPANDABLE TO)	COLOUR	Disk storage: 3.5in	5.25in	8in	HARD	TAPE	FLOPPY (KB)	Interface: HARD (MB)	RS232	PARALLEL	MAXIMUM USERS	COMMENTS
Altos 8600	12470	13510	15590		A		A			A	●			256K (1MB)			2	●		1MB	20					5, 10, 40MB hard disks avail.
Bleasdale	13866	15066	16266						●			●		256K (2MB)		●		●	●	1MB	20	10		16		wide range of hardware power
Britannia	13200	14400	16800		●						●			64K		2				800		2	2			wide range of hardware power
Rair	5750	7125			A		A				●	●		256K (2MB)		●				780	19	2		4		colour screen. MP/M
Sage	7050	8250		A	A			●				●		256K (512K)		2		●		320	12	●	●			6 – 18MB hard disks & Mirage avail.
Fortune	12170	13970	17510					●				●		256K (1MB)		2	●			800	5		2	16		user friendly front end

MULTIPROCESSOR

MACHINE	PRICE (£s) No. OF USERS 2	4	8	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	PSYSTEM	UNIX	OWN	4. FEATURES OF THE SYSTEM: CPU (No. of bits) 8	16	32	RAM (EXPANDABLE TO)	COLOUR	Disk storage: 3.5in	5.25in	8in	HARD	TAPE	FLOPPY (KB)	Interface: HARD (MB)	RS232	PARALLEL	MAXIMUM USERS	COMMENTS
SuperStar	6075	8075	12075			●					A	●		64K (1MB)		●			●	800	8	●	●	16		S100 8bit or 16bit available
Multicomputer	5250	7650	12450		A					●	●	A		64K (1MB)		●			●	512	10	●		8		
Minstrel	5320	7270	11170		A						●	●	●	64K (1MB)		●			●	800	20	2	●			Minos & Turbodos + 5, 10, 40MB disk
Jarrogate	7510	8900	14160							A	●			64K (512K)				●		390		3	3	16		S100 slot
Triton	9275	10675	15375	A							●			64K (640K)			2	●		1MB		4		16		128MB hard disk & 16 RS232; 8 C'nic

NETWORK

MACHINE	PRICE (£s) No. OF USERS 2	4	8	2. OPERATING SYSTEM: BOS	CP/M	CCP/M	MSDOS	PSYSTEM	UNIX	OWN	4. FEATURES OF THE SYSTEM: CPU (No. of bits) 8	16	32	RAM	COLOUR	Disk storage: 3.5in	5.25in	8in	HARD	TAPE	FLOPPY (KB)	HARD (MB)	MAXIMUM USERS	COMMENTS
Hinet (DMS)	12900	15700	21300		●					●	●			64K each				●	●	●	256	10	32	CP/M linked system
Clearway	150 per user																						99	simple node network requiring only RS232 port
Future	4375	6725	11355		●						●			128K each			●			800	10	16		CP/M linked system
PC/Net	7900	13200	23800				●				●			128K each			●			360	10	8		
XIONICS	10950	14900	22800							●	●			128K each							20	8		micro node system complete with software

The first extra item your computer needs if it is to function fully is a printer. This is how various printers work

THE PRINTED WORD

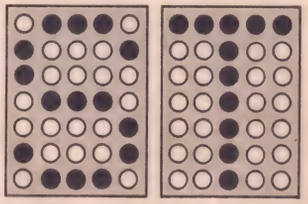
To preserve the output of your computer, you need a printer. Ideally this would combine quality of print with speed, but currently you can only have one or the other, according to the type of printer you choose – dot matrix or "daisywheel". No printer excels in both.

The highest quality printing comes from a daisywheel printer. In fact, there are adaptors available for some of the better typewriters so that they can be used as printers. You gain by having a dual purpose machine: but it will not be as quick or as versatile as a purpose-made printer.

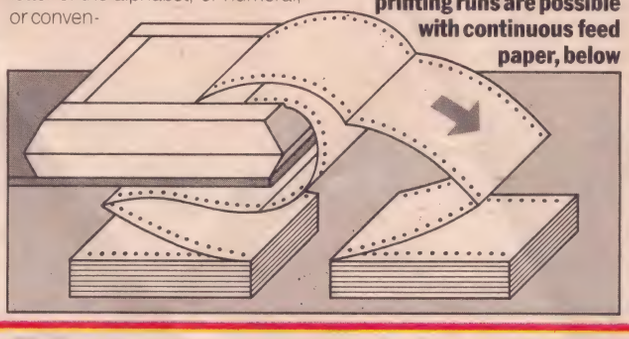
A purpose-built, "letter quality" printer will still use the daisywheel system and as one might expect, the print quality reflects the quality of engineering: the best daisywheel machines print very well indeed. They often can print in what looks like a "bold" typeface, for example. They may have an extended range of characters – giving foreign letters with accents, say or scientific symbols. The better versions have a tray to carry a stack of sheets of paper that are fed automatically into the printer. Again, purpose-made daisywheel printers often also have a traction drive – essentially toothed rollers – so that they can use the familiar computer printout paper that comes as a continuous perforated strip, folded. This will run, accurately and quickly through the machine.

Even then, a daisywheel printer cannot match a dot matrix printer for speed. The print head of a dot matrix printer is a row of needles – on the simplest machines a row of seven. This whizzes across the space where a letter is to be printed, printing dots that make up a printed letter. This simple version will make dots within a rectangle that contains five vertical rows of seven dots – a 5 x 7 matrix – and any letter of the alphabet, or numeral, or conventional sign – can be printed by some combination of these other 35 dots.

That is, it can be printed after a fashion. The letters have to be aligned in a rather odd way – "g"s and "p"s and "q"s, for example, have to be raised so that their "descenders" – their tails – are above the line. This makes simple dot-matrix print unpleasant to look at and tiring to read. So better, and usually more expensive, dot matrix printers have more dots to the matrix – 7 x 9 or even 9 x 12. These can give a very acceptable printed page: the best dot matrix printers are better than the worst daisywheel machines.

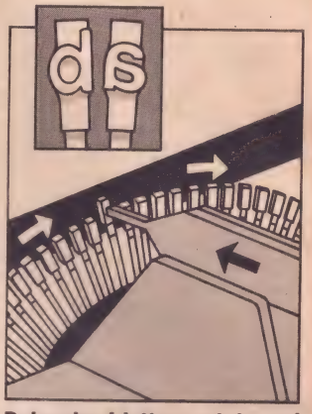


Letters on a dot matrix printer are formed by selecting points from a grid or matrix. Faster printing runs are possible with continuous feed paper, below



The needles of a dot matrix printer strike a somewhat specialised typewriter ribbon – they must if they are to print on ordinary paper. But there are other versions that heat the needles so as to print on a special paper, and yet others that give the needles an electrostatic charge that sparks to make a tiny mark on another kind of specialised paper. Though these printers, need special paper, they do not need a typewriter ribbon, so that there can be a "swings and roundabouts" balance of cost. And the heat or electrostatic printers can be faster than those using a typewriter ribbon. And quieter: a rapidly running printer can make a room very unpleasant with its noise.

Not every printer will connect to every computer. Some home computers have connections that will accept only their own printers or machines that are specially made to fit. For more general use, there are two main standard connections – interface is the technical word. One is the Centronics: the other the RS232C. Your printer must match your computer in its connections. It must also match it in the rate at which information is transmitted – the Baud rate. Both should be checked.



Daisywheel letters rotate and are punched onto the ribbon. Print speed is relatively slow

ILLUSTRATIONS BY JOHN GRIMWADE

Some people are right more often than others.

One of the greatest assets in business, is being able to tell what's going to happen next.

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The Computer Bureau is veneered in solid wood, satin finished in either mahogany or pine. And this isn't restricted to just the parts you can see. The undersides of the shelves, the inside facing of the sides, even the back, receive the same attention to detail.

Why have we gone to such lengths? To create a piece of furniture as beautiful as it is functional – and just as much at home in the lounge as it is in the bedroom or study.

PLENTY OF SPACE FOR ANY SIZE OF HOME COMPUTER SYSTEM.

We looked at the requirements of home computer users – and designed the Computer Bureau accordingly. It's 36″ tall, and the 12½″ × 32½″ top holds most popular monitors or smaller TV's solidly and safely. The 20″ × 31″ main desk surface provides space for your keyboard, while leaving easy acccess to a special recessed shelf for cassette and disc storage; and there's plenty of room for a cassette unit or disc drive, and even a printer. The low level document shelf can be located to the left or right, whichever suits you best. And the back features cut-outs for leads, again for left or right hand positioning of your equipment.

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WHERE TO GO TO LEARN MORE

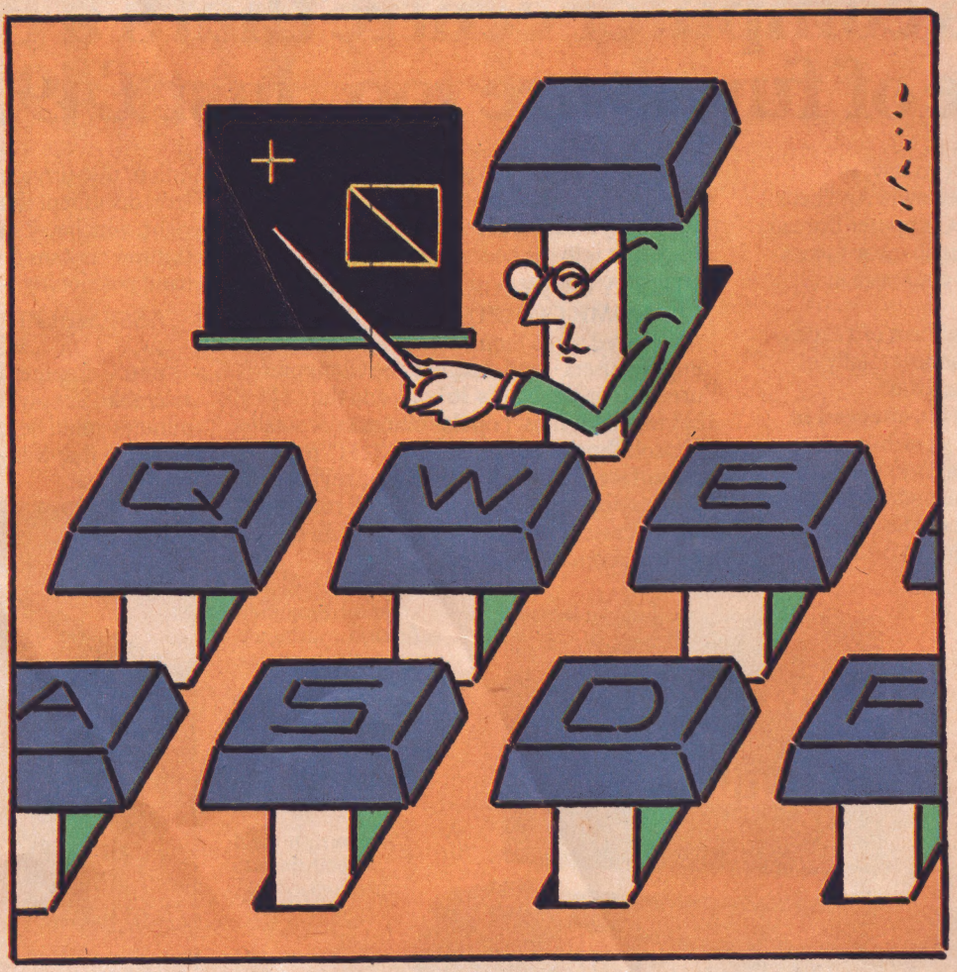

ILLUSTRATION BY BRIAN GRIMWOOD

Whether you're thinking of buying a microcomputer, have just unpacked one at home or have successfully implemented a small business application, the question of what to do next will surely arise. To help you find an answer, here are some ideas and pointers for current and future reference.

Almost without exception, the organisations and contacts listed here are non-profit making. When you write for more information please include a stamped, self-addressed envelope.

COMPUTER TOWNS

Computer Town UK! is a federation of meeting places where volunteer enthusiasts welcome computer novices and get them started. Computer Towns meet in places such as schools, libraries and church halls – discover if there's one near you by writing to Margaret Spooner, CTUK!, 62 Oxford Street, London W1A 2HG. Cognoscenti can start up a Computer Town and guidelines for doing so are also available.

MICROSYSTEMS CENTRES

A well-written and amusing bulletin on a different source of access to computers and computing advice can be had by sending stamps to the value of 20p (in addition to a SAE) to Philip Virgo of the London Microsystems Centre. As well as explaining what the 17 centres, set up with government backing, have to offer, the bulletin contains the addresses and phone numbers of all 17 Microsystems Centres. Write to 11 New Fetter Lane, London EC4A 1PU.

PRESTEL

This is a database (computerised filing system) which contains hundreds of pages of information (data). The pages are composed by information providers (advertisers), known in the jargon as IPs. One of these IPs, Micronet 800, constitutes a Prestel closed user group specifically for microcomputer owners. Micronet members can receive programs over the phone from Micronet's computer ("downloading"), read the latest computing news on their TV screens, ask for technical help and communicate with other owners. To use Prestel (and therefore Micronet) you'll need an acoustic coupler or a separate modem to carry signals between your computer and external computers via the domestic telephone line.

To become a member of Micronet you pay a joining fee of £50 to £75 (which includes supply of a coupler suited to your micro) and £8 per quarter on top of normal Prestel charges. This gives you access not just to Micronet but to the rest of Prestel as well. Phone Micronet on 01-278 3143, or write to 8 Herbal Hill, London EC1.

BULLETIN BOARDS

Micronet is an example of how communication can become a hobby in itself for micro-owners. The real citizens bands of the micro world are bulletin boards. With enough dedication you can run your own and start a newspaper, special interest group or noticeboard, but you can simply enjoy the thrill of existing boards, using your computer to communicate throughout Europe and beyond. *PCW* runs a column, Network News, in which details of access to bulletin boards are given, or write to Fred Brown at the Association of Free Public Access Systems (AFPSA) at 421 Endike Lane, Hull HU6 8AJ.

CLUBS

Also on Micronet are details of micro clubs nationwide, affiliated to the Amateur Computer Club and Association of Computer Clubs. Such clubs often have sections devoted to particular computers and can be a good source of contacts for other computer-related activities. For details about what's going on in your area write to Andy Leader, Church Farm, Stratton St. Michael, NR15 2QB.

SPECIAL INTERESTS

Moving on to activities and interests that can be pursued with computers, the following list, arranged alphabetically, is by no means exhaustive. It is, however, representative of the variety of possibilities open to you when you decide to take microcomputing a step further.

Adventure Gaming A helpline for people who get stuck in dungeons or attacked by dragons is available on Micronet, page *800821011#

Astrology The preparation of birth charts involves many complicated calculations and plots, for which computers are ideal. Micro-astrologist Roger Elliot, The Manor, Coffington, Bridgewater, Somerset TA7 8JR, is a contact for further information, as is Chryss Craswell, telephone 01-673 0263.

Astronomy Dr John Zarnecki of the Space Sciences Lab, University of Kent, Canterbury, would like to hear from micro owners interested in astronomy and space research. There is also a British Astronomical Society Users Group: contact Mr M. Gabin, 79 Ardrossan Gardens, Worcester Park, Surrey.

British Amateur Radio Teleprinter User Group In the old days, computers communicated via printers, not screens. Microcomputer owners interested in communications in general and teleprinters in particular should contact Edward Batts, 27 Cranmer Court, Richmond Road, Kingston Upon Thames, Surrey.

Chess The only regular computer chess column is written by Tony Harrington for *PCW*. For further information about chess on computers write to him at 81 Hornby Road, Brighton BN24.

CP/M The most popular disk operating system for small business computers using the Z-80 chip. For details on the activities of the UK CP/M Users' Group, contact the membership secretary, 72 Mill Road, Hawley, Dartford, Kent.

Deafness The Visicom project is investigating how deaf people can make use of telephone/microprocessor-controlled communications systems. Information: 8 Braemar Close, Godalming, Surrey.

dBASE II This successful database program has its own user group. It may sound odd for a program to turn into a hobby, but there is more to costly software than is revealed in the documentation, and user groups find out how to get at the extra bits. Phone Caroline Turner on 0908 568866.

Esperanto It may come as something of a surprise to learn that computers can teach you Esperanto. The first lessons of a free course (for BBC and UK101 machines now, others later) are available from the Esperanto Centre, 140 Holland Park Avenue, London W11 4UF. Mr Herbert Platt at the same address has a register of computer-owning Esperanto speakers.

Farming and Agriculture The NFU has a computer department which can provide information on the use of micros in farming and agriculture. Contact George Sharples, Agriculture House, London Road, Devizes SN10 2DT.

Ley Lines If you are a computer-owning ley enthusiast (lines joining prominent points in a landscape, thought to indicate prehistoric tracks), then Mike Powell would like to hear from you – via Prestel only, please, Mailbox 565893530.

Politics The Liberals are the most progressive here with MicroLib (not an organisation dedicated to the burning of printed circuit boards). If you want to use your micro politically, here's who to get in touch with. Liberal: David Asmer, MicroLib, ALC, The Birchcliffe Centre, Hebden Bridge, W Yorks HX7 8DJ. Labour: Harold Frayman, Computer Advisory Group, 150 Walworth Road, London SE17 1JT. Conservative: Constituency Computer Adviser, 32 Smith Sq. London SW1.

Pop Music. Computer pop sounds an unlikely combination, but it can be done. Gwil Stephenson, manager of Dislocation Dance, has the information at 13 Ellesmere Road, Chorlton, Manchester M21 1SG.

Robot Interest Group. If you think a robot would be a useful thing to have around, but can't quite work out how to create one this group is currently building a project and welcomes interest from new enthusiasts who don't have access to robots in everyday life. Regular meetings are held; your contact is Don Forbes, on 01-688 5794.

COURSES

Finally, you may want to undertake a more formal course of study to help get the best out of your micro.

Courses at all levels on subjects from Beginners All-purpose Symbolic Instruction Code (Basic) at evening classes, to chip design and electronic circuitry at intensive specialist centres are available.

Good places to enquire about courses in your area are the Local Education Authority, the Citizens Advice Bureaux – and the computer magazines.

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Living With The Computer is a section of the *Sunday Times* Magazine and may not be sold separately from *The Sunday Times*.

The new Electron from Acorn – W. H. Smith price £199.

Does their language change when they get home from school?

Most schoolchildren have one thing in common with the new Acorn Electron micro-computer: they speak the same language – BBC Basic, the computer language that is rapidly becoming the standard in schools.

Now children will be able to continue their computer studies at home, but at only half the price.

Because whereas the BBC Micro (chosen by over 80% of schools participating in the Government's 'Micros in Schools' project) costs £399, the Acorn Electron (equipped with most of the functions of the BBC, as well as a similar keyboard) costs £199 and is available from major branches of W. H. Smith.

Of course you don't have to be at school to appreciate the advantages of the Acorn Electron. It's the ideal computer for anyone whether he or she wishes simply to learn about computing, or to progress to a more sophisticated machine.

Consider the design for example: its 56 key electric typewriter style keyboard is robustly constructed with a good solid feel.

The advanced specifications: the Acorn Electron provides 7 different display modes, from a full 80 columns of text across the screen, to the clear and sharply defined colour graphics necessary for games.

And the documentation: the Electron comes not only with a comprehensive user-guide, but also with a book that takes you through the principles of Basic programming, as well as a demonstration cassette containing 15 programs.

The Acorn Electron can be connected to a normal colour television, and is compatible with most domestic cassette recorders.

At £199 it represents outstanding value for money.

How to get your Acorn Electron

The major distributor of this long-awaited computer is W. H. Smith. All our computer staff have been trained how to use the Acorn Electron. And you'll find we've got a complete range of Acorn Electron software. So come in and see us.

WHSMITH

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'Try-before-you-buy' is available only for the original Sage Accounts program -the truly integrated book-keeping/accounting program which comes on one diskette and provides:–

- Sales/Purchase/Nominal ledgers
- VAT analysis
- Monthly and Annual accounts
- Age analyses
- Statements
- Audit Trail etc.

The Sage range also includes more comprehensive products like Sage Plus – £525. Sage Executive – £695 and Sage Payroll – £195. They can be seen and tried at any of our 650 UK dealers!

Sage is available on most CP/M, MS-DOS and PC-DOS computers and has so far been implemented on over 40 machines including Apricot, Apple, Epson, IBM-PC, Sanyo, Philips, Sirius and Zenith.

If you need any further persuasion to give Sage a try, perhaps the following two quotes will do the trick. "Undoubtedly the best value for money on the market." Personal Computer World. "The hottest property in business software." Micro Decision.

Remember, 'better SAGE than sorry.'

SAGE
Innovation not imitation

SAGE

Try-before-you-buy offer.

☐ Please supply a SAGE 'try-before-you-buy' program and 32 page instruction booklet. I enclose a cheque for £20.00 inclusive of VAT and postage which I understand will be refunded in full against the purchase of any SAGE accounting program costing at least £375 + VAT.

Name: _____

Company: _____

Address: _____

_____

_____ Tel: _____

I require a program diskette suitable for the following computer:

Make: _____

Model: _____

Operating System: _____

☐ I do not yet own a computer. Please send me the address of the nearest dealer where I can try Sage.

☐ Before I try SAGE, please send me details of the full software range.

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